VA 2: Desorption

VA 2.1   Mon 14:00   HFT-FT 131

Outgassing rate measurement by using the difference method — •KATHARINA BATTES and VOLKER HAUER — Karlsruhe Institute of Technology (KIT), D-76344 Eggenstein-Leopoldshafen, Germany

Outgassing plays an important role in the field of vacuum technology, especially if ultrahigh vacuum conditions shall be reached. For example hydrogen desorption from stainless steel is a common problem. For building new vacuum systems the outgassing rates of the materials should be strongly considered.

Often, outgassing rates of different materials are reduced by a pre-treatment like electro-polishing, baking or vacuum-firing.

However, the theory of outgassing is quite complicated and not yet fully understood. Also, experimental results reported in the literature are often not consistent. This is why new experimental efforts are under way at KIT to provide a better understanding.

The two main methods to measure outgassing rates are the pressure-rise method and the throughput method.

The new outgassing measurement apparatus currently being built at KIT uses the difference method (a modified throughput method). With this method the pressure difference between two identical vacuum chambers, with one containing the sample and the other acting as a reference, is measured to achieve the outgassing rate of the sample. Like this, the outgassing of the vacuum chamber can be subtracted and also very low sample outgassing rates can be measured.

This paper introduces in the various outgassing measurement concepts and describes the current status of the new facility.

VA 2.2   Mon 14:20   HFT-FT 131

AP-TDS characterization of CO_2 methanation catalysts — •MATTHIAS STÄDTER and DIETER SCHMEISSER — Brandenburg University of Technology, Cottbus, Germany

Development of new catalysts and their characterization by TDS (thermal desorption spectroscopy) is used in a wide field of applications. In our group we focus on catalysts usable to convert CO_2 towards methane by the Sabatier reaction ($CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$ at $375°C$). For measuring large numbers of samples we designed an AP-TDS (ambient pressure TDS) chamber where various desorption experiments can be performed without bringing the catalyst into vacuum. The well-defined reaction chamber, in terms of temperature, pressure and gas composition (Ar atmosphere), is separated by a pin hole ($\emptyset = 6 \ \mu m$) from an external UHV chamber. Evolving species and their composition are monitored by a mass spectrometer attached to the UHV chamber. Our first measurement results on commercially available NiO/SiO_2 and Ru/Al_2O_3 based catalysts, with focus on the identification and enumeration of different adsorption sites for CO_2, will be presented. CO_2 saturated samples were heated from RT to $1100°C$ (heating rate $\beta = 0.3$ K/s) while measuring the evolution of the CO_2 content. Our measurements show large numbers of different adsorption sites for NiO (200-$750°C$) whereas Ru shows only few different sites around $440°C$. For both catalysts, most of the formerly adsorbed CO_2 remains at the surface (at $375°C$) available for methanation.